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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/034,732	12/28/2001	Sudhakar Bobba	03226.156001;P6864	1384

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EXAMINER

CHU, CHRIS C

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 03/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/034,732

Applicant(s)

BOBBA ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on November 28, 2003 has been received and entered in the case.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1 ~ 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujiki et al. '791.

Regarding claim 1, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 a bump and vias structure, comprising:

- a metal layer (6);
- a bump (10 on D) mounted on a landing pad portion (D; column 10, lines 60 - 67) of the metal layer;

- a first plurality of vias (5, at the top-right corner) disposed on a first outer region (at the top-right corner where the elements 5 are located) of the metal layer, wherein the first outer region has a first density of vias; and
- a second plurality of vias (5, at the bottom-right corner) disposed on a second outer region (at the bottom-right corner where the elements 5 are located) of the metal layer, wherein the second outer region has a second density of vias,
- wherein the first density and second density are greater than a third density of vias disposed on a central region (at the middle area where the elements 5 are not located) between the first and second outer regions, and
- wherein vias in at least one of the first outer region, the second outer region, and the central region are laterally peripheral to the landing pad portion (D).

Regarding claims 2, 9 and 16, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 the first density being substantially equal to the second density.

Regarding claims 3, 10 and 17, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 a first current path from the first outer region to the bump being substantially equal to a second current path from the second outer region to the bump.

Regarding claims 4, 11 and 18, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 there being no vias in the central region.

Regarding claims 5, 12 and 19, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 current injection from the first outer region to the bump being greater than current injection from the central region to the bump.

Regarding claims 6, 13 and 20, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 current injection from the second outer region to the bump being greater than current injection from the central region to the bump.

Regarding claims 7, 14 and 21, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 the central region being positioned further from the bump than the first and second outer regions.

Regarding claim 8, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 an integrated circuit, comprising:

- a metal layer (6);
- a bump (10 on D) mounted on a landing pad portion (D; column 10, lines 60 - 67) of the metal layer;
- a first plurality of vias (5, at the top-right corner) disposed on a first outer region (at the top-right corner where the elements 5 are located) of the metal layer, wherein the first outer region has a first density of vias; and
- a second plurality of vias (5, at the bottom-right corner) disposed on a second outer region (at the bottom-right corner where the elements 5 are located) of the metal layer, wherein the second outer region has a second density of vias,
- wherein the first density and second density are greater than a third density of vias disposed on a central region (at the middle area where the elements 5 are not located) between the first and second outer regions, and
- wherein vias in at least one of the first outer region, the second outer region, and the central region are laterally peripheral to the landing pad portion (D).

Regarding claim 15, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 a method for reducing current crowding in a bump and vias structure, comprising:

- distributing current from a first outer region (at the top area where the elements 5 are located) of a metal layer (6) to a bump (10 on D) mounted on a landing pad portion (D; column 10, lines 60 - 67) of the metal layer, wherein the first outer region has a first density of vias (5, at the top); and
- distributing current from a second outer region (at the bottom area where the elements 5 are located) of the metal layer to the bump, wherein the second outer region has a second density of vias (5, at the bottom),
- wherein the first density and second density are greater than a third density of vias disposed in a central region (at the middle area where the element 5 are not exist) between the first and second outer regions, and
- wherein vias in at least one of the first outer region, the second outer region, and the central region are laterally peripheral to the landing pad portion (D).

Regarding claim 22, Fujiki et al. discloses in e.g., Fig. 3, Fig. 7 and column 10, lines 38 ~ 67 a method for reducing current crowding on a bump, comprising:

- defining a first region (at the top area where the elements 5 are located) and a second region (at the bottom area where the elements 5 are located) on a metal layer (3) having a landing pad portion (D; column 10, lines 60 - 67) to which the bump (10) is mounted;
- determining a first current path length from the first region to the bump;
- determining a second current path length from the second region to the bump;

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- selectively disposing a first plurality of vias (5, at the top) in the first region at a first density depending on the first current path length; and
- selectively disposing a second plurality of vias (5, at the bottom) in the second region at a second density depending on the second current path length,
- wherein vias in at least one of the first outer region, the second outer region, and the central region are laterally peripheral to the landing pad portion (D).

4. Claims 22 ~ 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsai et al. '970.

Regarding claim 22, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A, Fig. 4B and column 1, lines 14 – 15 a method for reducing current crowding on a bump (the bump on the uppermost layer of the element 11), comprising:

- defining a first region (at the top-right corner area where the element D are located) and a second region (at the middle area where the element D are not located) on a metal layer (11 or 41) having a landing pad portion (C) to which the bump (the bump on the uppermost layer of the element 11) is mounted;
- determining a first current path length from the first region to the bump;
- determining a second current path length from the second region to the bump;
- selectively disposing a first plurality of vias (423, at the top-right corner area) in the first region (at the top-right corner area where the element D is located) at a first density depending on the first current path length; and

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- selectively disposing a second plurality of vias (423, at the middle area where the element D is not located) in the second region (at the middle area where the element D is not located) at a second density depending on the second current path length,
- wherein vias in at least one of the first outer region, the second outer region, and the central region are laterally peripheral to the landing pad portion (C).

Regarding claim 23, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A and Fig. 4B the first current path length being longer than the second current path length, and wherein the first density is greater than the second density.

Regarding claim 24, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A and Fig. 4B the second plurality of vias being disposed further from the bump than the first plurality of vias.

Regarding claim 25, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A, Fig. 4B and column 1, lines 14 – 15 further comprising:

- defining a third region (at the bottom-right corner area where the element D is located) on the metal layer;
- determining a third current path length from the third region to the bump; and
- disposing a third plurality of vias (423, at the bottom-right corner area) in the third region at a third density depending on the third current path length.

Regarding claim 26, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A and Fig. 4B the third current path length being longer than the second current path length, and wherein the third density is greater than the second density.

Regarding claim 27, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A and Fig. 4B the second plurality of vias being disposed further from the bump than the third plurality of vias.

Regarding claim 28, Tsai et al. discloses in e.g., Fig. 3B, Fig. 4A and Fig. 4B the first density being substantially equal to the third density.

Response to Arguments

5. Applicant's arguments filed on November 28, 2003 have been fully considered but they are either moot in light of the new grounds of rejection or are not persuasive.

On page 13, applicant argues "Fujiki ... fails to consider, and thereby fails to disclose, the positioning of vias *laterally peripheral* to a landing pad portion to which a bump is mounted in an arrangement ... as required by amended independent claims 1, 8, 15 and 22 of the present application." This argument is not persuasive. Fujiki et al. clearly discloses in e.g., Fig. 7 and column 10, lines 60 - 67 the positioning of vias (5) *laterally peripheral* to a landing pad portion (D) to which a bump (10 on the element D) being mounted in an arrangement.

For the above reasons, the rejection is maintained.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

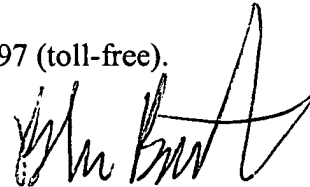
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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 517-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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BRADLEY BAUMEISTER
PRIMARY EXAMINER